



Sustainable urban water management and integrated development in informal settlements: The contested politics of co-production in Santo Domingo, Dominican Republic

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ABSTRACT

Given the implications of global climate change, including higher likelihood of extreme weather events, and the increasing urban density coupled with reduction in permeable surfaces in the Global South, Sustainable Urban Water Management (SUWM) has emerged as a preferred paradigm for stormwater management. However, the implementation of SUWM, which is premised on using vegetation or engineered capture technologies to control runoff at its source in an effort to replicate natural hydrology, is limited by a lack of institutional integration, not merely between administrative organs with responsibility for stormwater management but also between infrastructure departments, planning institutions, communities, and civil society organizations. This is particularly true in informal settlements in the humid tropics, where excessive impermeable surfaces and a lack of adequate solid waste collection exacerbate municipal limitations in stormwater management. This article discusses an effort to integrate local communities, civil society organizations, and local and regional authorities to improve drainage services within the framework of integrated development in the informal settlement of Los Platanitos, Santo Domingo Norte, Dominican Republic. In order to address the drainage and flooding issues in Los Platanitos while also fostering economic development, representatives of community groups, NGOs, local government, and state agencies have developed a participatory planning structure known as a mesa de concertación, or “co-operating table.” The mesa, which was established in 2014, has succeeded in bringing neighborhood, civil society, and government actors to the same “table” as a mechanism for addressing the community’s drainage challenges within the broader context of integrated community development.

1. Introduction

Sustainable Urban Water Management (SUWM), which is premised on a holistic approach to managing urban stormwater that considers the long-term needs of both human and ecological systems, has emerged as a preferred paradigm for stormwater management. Alternatively known as water sensitive urban design, low impact urban development, low impact development (LID), best management practices (BMP), green stormwater infrastructure (GSI), and sustainable urban drainage systems (SUDS), SUWM draws on decentralized approaches to capture and treat runoff from smaller, more frequent storms at its source in an effort to replicate natural hydrology.

The SUWM paradigm stands in contrast to the “19th-century sanitary philosophy” of urban drainage (Silveira, 2002), which favors unfunctional systems that collect stormwater from impervious surfaces for

quick transportation to water bodies, treatment facilities (MacMullan and Reich, 2007; Reed, 2004) or other end-of-pipe solutions (Miguez et al., 2015), often causing downstream erosion and flooding impacts. Given the implications of global climate change, including higher likelihood of extreme weather events such as flood and drought, coupled with increasing urban density in the Global South, such sustainable approaches to stormwater management have gained increasing urgency (Brown et al., 2013; Farrelly and Brown, 2011; Ferguson et al., 2013). Today, SUWM and related approaches have emerged as a preferred trajectory for realizing “integrated infrastructure and biophysical systems, which consider social, economic, environmental and political contexts, provision of water for ecological and human uses, and a long term perspective” (van de Meene et al., 2011, 1117).

However, implementing SUWM is challenging due to limitations in governance, including institutional inertia and fragmentation

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(Goldenfum et al., 2007; Reed, 2004; Silveira et al., 2001, 125); a lack of organizational and professional capacity and willingness to adopt new practices (Ferguson et al., 2013; see also Brown, 2008; Farrelly and Brown, 2011; Pahl-Wostl, 2009); overly centralized decision making processes coupled with a lack of consideration of the complexities of environmental management (Gogate and Rawal, 2012); the persistence and highly interwoven nature of existing routines, infrastructures, institutions and cultures (Brown et al., 2013); and a lack of data, technical information and environmental education for legislators, decision makers and the general public (Goldenfum et al., 2007).

A particularly significant challenge to implementing SUWM in the humid tropics is a lack of effective institutional integration, not merely between administrative organs with responsibility for stormwater management (Goldenfum et al., 2007) but also between infrastructure departments, planning institutions, communities, and civil society organizations (Tucci, 2001; Gogate and Rawal, 2012; Miguez et al., 2015). This lack of integration stems from fragmentation of infrastructure departments and a tendency to protect perceived institutional purviews rather than seek collaborative arrangements (Miguez et al., 2015). Furthermore, poor political leadership (van de Meene et al., 2011) and vertical infrastructure governance structures often lead to the exclusion of informal institutions such as community organizations from participating in integrated stormwater management approaches (Pahl-Wostl, 2009). This lack of institutional integration limits the capacity for long-term strategic planning, which is essential in order to tackle the interconnected social, economic, environmental and political dimensions of stormwater management (van de Meene et al., 2011). In particular, lack of adequate solid waste management services in many informal settlements (Pegram et al., 1999) can exacerbate flooding problems by blocking drainage systems (Olukanni et al., 2014; Parkinson, 2003; Parkinson et al., 2007).

Given the importance of strengthened institutional integration, research in networked governance may hold promise for the development of effective SUWM in rapidly growing cities in the humid tropics. A consensus is emerging that networked governance, through its emphasis on reciprocity and participation by public, private and civil actors, may foster innovative public policy development and sustainability transitions in the area of environmental governance (Klijn and Koppenjan, 2000; Kooiman and Jentoft, 2009; Lemos and Agrawal, 2006; Pahl-Wostl, 2009). In our discussion here we are particularly informed by the concept of bridging organizations, which, as the name suggests, are critical to facilitating networked governance. Bridging organizations are distinct from boundary organizations, which emerge from science-policy interface arrangements with clearly defined organizational structures, but both concepts are concerned with “linking actors across domains, disciplines, and hierarchical levels, facilitating communication and enhancing some form of collaborative output” (Crona and Parker, 2012).

In the following article, we discuss an emerging example of networked governance for SUWM in Los Platanitos, Santo Domingo Norte, Dominican Republic, focusing on the efforts to link local communities, civil society organizations, and local and regional authorities in order to co-produce drainage services within the framework of integrated development. Los Platanitos is an informal settlement of some 2000 people located in a deep ravine at the lower end of an extensive drainage system. The neighborhood is characterized by a prevalence of impervious cover developed without consideration of downstream drainage impacts, a fragmented and haphazardly developed drainage system of undersized culverts and channels, and a lack of municipal waste collection, which leads to accumulation of solid waste in public spaces as well as within drainage infrastructure. Although residents of Los Platanitos have developed intricate, informal infrastructure systems and practices to mitigate flooding and to cope with the solid waste issue, the community is nevertheless subject to frequent flooding, not merely during hurricane season but even after relatively short yet intense rains.

In order to address the flooding issues in Los Platanitos while also fostering economic development, in 2014 representatives of community groups, NGOs, local government, and state agencies developed a platform for service co-production known as a *Mesa de concertación* (“co-operating table;” henceforth referred to as the *Mesa*). The goal of the *Mesa* is to bring neighborhood, civil society, and government actors to the same “table” as a mechanism for addressing drainage challenges based on the site-specific needs and capacities of Los Platanitos residents. Although Los Platanitos struggles with numerous challenges typical of informal settlements in the Dominican Republic, residents have also developed strong mutual support networks and a thriving informal economy, including promising micro-entrepreneurship initiatives based on plastics recycling and composting of household waste. These local attempts to convert solid waste into income-generating opportunities lie at the heart of the integrated development work of the *Mesa*, as it seeks to foster economic development projects building on local capacities while at the same time coordinating the development of an integrated SUWM strategy.

As Brown et al. (2013) argue, the success of networked governance for SUWM relies in large part on small groups of “frontrunners” who form loose and shifting alliances over time in order to steer sustainability transitions. Building on the premise “that under certain systemic conditions, specific kinds of actors can, in co-creation, heavily influence the course, speed and direction of transitions” (Brown et al., 2013, 703), the actors engaged in the *Mesa* can be thought of as frontrunners who are negotiating and innovating drainage solutions as well as social and economic development projects within a framework of integrated community development.

In order to better understand the potentials of such frontrunners for the development of SUWM, however, it is necessary to document the intricate relationship-building efforts associated with the co-production process (Brown et al., 2013) under networked governance. We are inspired here by Brown et al.’s descriptive and exploratory case study of Melbourne, Australia, where they drew on oral histories, semi-structured interviews, industry workshops and documentary analysis to examine the actor-related strategies as well as institutional structures that enabled a transition to SUWM. In the following, we similarly pursue longitudinal ethnographic methods to document the nuances and shifting contingencies of relationship-building for networked governance across multiple “frontrunners” and differently situated communities of practice and actor groups, but we bring such a situated case-study approach to a context characterized by informality and severe structural imbalances between the community and the state.

2. Co-production and networked governance for SUWM

Given the history of marginalization of low-income residents from formal governance processes in Santo Domingo and elsewhere in the region, strategies for networked governance need to account for severe structural inequalities and barriers to communication across various actor groups, often derived from long-held prejudices. Research on slum upgrading emphasizes the importance of state-society collaborations (such as Adegun, (2015) reports in the case of South Africa) and co-management via participatory budgeting processes (as documented by Pimentel Walker, (2016) in Brazil), but there is little ethnographic research on the myriad, site-specific social and environmental determinants and practices of stormwater management in informal settlements (Justo and Kenney, 2016; Parkinson, 2003; Parkinson et al., 2007) and even less investigation of the relations of power that shape the prospects of networked governance for stormwater management service provision in informal settlements.

Particularly in contexts of urban informality in the Global South, therefore, it is necessary to develop a more critical approach to co-production of service provision that challenges typical state-community relationship structures. Service provision co-production (similar to knowledge co-production, which is concerned with fostering new and

joint ways of knowing) involves “the joint production of public services between citizens and the state” in a way that allows the organized urban poor to “augment their capacity to negotiate successfully with the state” and “to strengthen their political position as well as address their more immediate development needs” (Mitlin, 2008, 340). Co-production is thus premised on productive engagement between multiple communities of development practice, including residents, agents of the state, and experts in different thematic and operational domains, in order to foster common understandings, narratives, and goals that, ultimately, may serve to structure actual implementation arrangements for service provision. However, by emphasizing the search for common ground between the state and the urban poor, certain conceptualizations of co-production may gloss over the ways in which structural power imbalances may shape networked governance and hence the functioning of co-produced integrated SUWM practices.

Power dynamics that influence relationships between different actors within networked governance are particularly complex in contexts such as Santo Domingo, where diverse actors often fulfill service provision roles that, in other contexts, might be ascribed to the state. In Santo Domingo, developmental-era assumptions about the roles and responsibilities of the state have been replaced by the “encroachment of a neoliberal logic” (Bayat and Biekart, 2009), expanding the number of actors expected to assume governance and welfare responsibilities (Swyngedouw, 2005; Nielsen, 2011; Campbell et al., 2014). Co-production of infrastructure service provision under neoliberal governance should therefore be understood as a contested terrain with an increasing number of actors competing for limited public resources. In such a context, even individual projects will likely be sites of contest and negotiation among differently situated actors (Cornwall and Brock, 2005; Crehan and Von Oppen, 1988).

This conceptualization of infrastructure service co-production as a contested terrain, in turn, requires critical assessment of the interests and rhetoric of state agencies as well as consideration of the positioning of community actors and civil society intermediaries as they seek to mobilize, influence, and/or control resources (Shin, 2012; Painter, 1997) and otherwise extract gains from the state (Watson, 2014, 25). Under neoliberal governance regimes such as that of the Dominican Republic, the state’s approach to co-production is significantly shaped by what McFarlane (2012, 2802) refers to as a discourse of “citizen entrepreneurialism” which celebrates individuals or communities that take the initiative to develop their own economic development and infrastructure projects. We have frequently observed in our own research in Santo Domingo that government officials appear to be most interested in engaging in co-production for service provision with communities and organizations that have already demonstrated an entrepreneurial capacity for self-organizing and action.

As community actors engage with state agents in co-production, therefore, they rhetorically deploy their own “precedent setting” or “do first, talk later” (Appadurai, 2001, 33) community development activities, such as the plastics recycling and composting projects in Los Platanitos, in order to demonstrate their engagement with the dominant entrepreneurial logic of neoliberal governance. In so doing, they participate in the development of a neighborhood-level, non-expert “community of practice” with shared assumptions, methods, and activities (Gonzalez et al., 2011). Within a community of practice, knowledge acquisition and reproduction is significantly influenced by social interactions with others who share common beliefs, interests or goals (Lave and Wenger, 1991; Kerno, 2008) that constitute highly-situated ways of “knowing in action” (Amin and Roberts, 2008). These highly-situated forms of knowledge, in turn, shape the nature of state-society partnerships and interactions between communities of practice such as the integrated stormwater management system emerging in Los Platanitos.

In the case of the Mesa, previously disconnected or isolated communities of practice—again both expert and non-expert—are placed in contact with one another to address a problem that crosses thematic

boundaries and knowledge domains. Thus the Mesa has the potential to facilitate the type of social interactions that can guide new patterns of knowledge acquisition and reproduction, in effect laying the groundwork for a new, hybrid community of practice. In the following, we seek to contribute critical insights into the sort of institutional relationships required for successful co-produced SUWM governance across multiple communities of practice in the context of informal settlements, as well to understand the limits of such relationships.

3. Materials and methods

The research presented here is based on 10 years of engaged scholarship by faculty members and graduate students from The University of Texas in collaboration with project partners from Los Platanitos, local government, and civil society organizations in Santo Domingo. The overarching goal of the engaged scholarship efforts in Los Platanitos, which began on the invitation of local government and community leaders in 2008, is to address the interconnected problem of flooding and solid waste while fostering integrated community development. The work has revolved around seven biannual service-learning courses taught by first author and attended by groups of 8–10 graduate students. Each course has focused on a research and design project proposed by community leaders and then designed by first author in collaboration with project partners. The work has ranged from basic research into the social, economic and ecological dimensions of community-based stormwater and solid waste management systems to capacity-building, participatory plan-making, and community-based design, eventually prompting community members to form two community-based development organizations—Fundación Los Platanitos and Mujeres Unidas—to lead local plastics recycling and composting projects, respectively (Sletto, 2013; Sletto (editor), 2008; Sletto, 2010, 2012, 2014, 2016; Sletto and Nygren, 2016). The engaged scholarship in Los Platanitos has fostered unusually strong working relationships among The University of Texas, local government, civil society organizations, and local community groups, eventually prompting the local project partners to independently form the Mesa to guide integrated development in Los Platanitos.

In addition to the research conducted during the service-learning courses, every year first author has conducted month-long research stays in Los Platanitos while one or more students have pursued independent field research leading to their doctoral or masters’ degrees. In each case, the engaged scholarship has sought to contribute to the capacity-building and community development needs of Los Platanitos and other informal settlements in Santo Domingo. In the case of the present article, the co-authors completed discrete independent research studies in the area of SUWM and integrated development in Santo Domingo following their participation in the service-learning courses.

In the summers of 2014 and 2015, co-author B conducted a study of local development culture, specifically documenting the priorities of multiple urban development actor groups engaged in neighborhood service co-production efforts, principally oriented around the experience of Los Platanitos. The goal was to reveal factors that seem to influence whether a project or initiative is likely to receive state or municipal support for implementation. The research included interviews with government officials, civil society representatives, and community development activists, as well as observations of public meetings between these actor groups, including the initial meetings of the Mesa. Because of the relationships co-author B built as part of his previous participation in the service-learning course, he enjoyed privileged access to community meetings, civil society strategy planning and grant-writing sessions, and encounters among community residents, civil society organizations and government officials.

In August 2015, co-author C investigated the feasibility and potential flood mitigation benefits of a self-provision model of stormwater management, specifically through the implementation of a network of decentralized green stormwater infrastructure controls in the

subwatersheds that contribute to flooding in Los Platanitos. This article will not report on co-author C's investigation and desktop study of the area's hydrology, but we draw on the co-author's semi-structured interviews with residents and institutional actors, including engineers from the Corporación de Acueducto y Alcantarillado de Santo Domingo (CAASD) (the water utility of the Santo Domingo Metropolitan area), for our analysis of formal and informal stormwater management practices in Los Platanitos and Santo Domingo more broadly.

Ultimately, Co-author B's research contributes to a deeper understanding of the development priorities, working assumptions and routines of key urban development actors engaged in service co-production in informal settlements. Findings from this research help illuminate the institutional limitations, resource constraints, and fragmented governance approaches to stormwater management that characterize Santo Domingo as reported by co-author C. In turn, the engaged scholarship and service-learning courses led by first author allow us to ground this institutional analysis in longitudinal engagement in a particular place and social context, thus allowing us to critically assess the emerging co-production practices of SUWM in Santo Domingo.

3.1. Stormwater management in Santo Domingo

Situated at the confluence of two major rivers, the Isabela and Ozama, Santo Domingo is traversed by hundreds of natural drainages, many of which are encroached upon by informal settlements. The city's storm drain system was constructed during the presidential administration of Rafael Trujillo from 1930 to 1961. Designed for a smaller city with less impervious cover, the system consists of one meter storm drains and six inch connectors that are frequently overwhelmed in larger storms. The expansion of this system has not kept pace with the rapid growth of the city: the system now serves less than 16% of the area between the Haina River, Arroyo Guzman, Arroyo Manzano, the Isabela River, Ozama River, and Avenida Charles de Gaulle. Compounding these limitations in the storm drain system, according to municipal stormwater engineers, is trash accumulation in the streets and gutters caused by inadequate solid waste management but also a lack of public awareness. In the words of one engineer with the Ayuntamiento Distrito Nacional (ADN), "because [residents] throw trash in the street, the trash travels down the gutters, and it travels through the oil/grit separator, into the sewers, and into the filters—and it clogs the filters. The cost of unclogging a filter is the same as constructing another one...So, in order to make our technical work more efficient, to do what has to be done to manage stormwater, we have to first educate the public."

Stormwater management in Santo Domingo is also highly reactive, due in part to the decentralization of state power to poorly prepared municipalities without the allocation of sufficient resources. The embrace of the neoliberal economic model in the 1990s resulted in a devolution of planning power from national to local governments and the decentralization of the former municipality of Santo Domingo into seven municipalities (*ayuntamientos*). Of these seven, the Ayuntamiento Distrito Nacional (ADN), which encompasses historical Santo Domingo and the wealthiest sections of the metropolitan area, has by far the greatest share of economic resources, the most experienced staff, and the highest tax revenue. The six peripheral *ayuntamientos*, including Ayuntamiento Santo Domingo Norte (ASDN), where Los Platanitos is located, must contend with unstable municipal administrations, limited fiscal resources, and extensive areas of informal settlements. While a metropolitan-wide stormwater plan was completed in 1997, the newer municipalities do not have the resources to implement it but instead are limited to responding to complaints and repairing to existing systems.

This reactive approach, which addresses acute flooding problems but not systemic deficiencies, is compounded by a fragmentation of urban management and planning responsibilities at the local level. The Planning Department regulates construction, Public Works constructs streets and gutters, and the Drainage Department performs

maintenance on the drainage system. Each department is funded through separate processes and interdepartmental coordination is uncommon. This has led to a dysfunctional system in which the use of infiltration boreholes by stormwater managers has contaminated the aquifer to a point that the provision of potable water by the CAASD has been severely constrained. Given the inability of local governments to effectively provide traditional centralized stormwater management, it is unlikely that such institutions could successfully initiate and implement a system-wide transition towards a source-controlled stormwater management regime.

Furthermore, SUWM concepts are not widely accepted in the Dominican Republic: in fact, they were universally viewed with skepticism during interviews with institutional actors. The overriding paradigm calls for stormwater to be conveyed as rapidly as possible to waterbodies via channels and buried conduits, regardless of potential downstream flooding, erosion, and water quality impacts. Thus, Santo Domingo's stormwater system is currently limited to technologies such as storm drains, inlets, inlet filters, oil/grit separators, and inlet registers designed to prevent trash from entering the drainage system. Controls designed to manage stormwater at its source, even those of the "grey" variety, are not typically required of development or installed by local governments. Maintaining natural systems, enhancing ecosystem services, providing open space, and protecting water quality are not generally considered within the purview of stormwater engineers. This institutional inertia and lack of confidence in decentralized infrastructure poses steep internal barriers to a top-down implementation of SUWM. Furthermore, even if this resistance from stormwater professionals could be overcome, the barriers posed by the lack of effective integrated planning and management remain.

Due to this insistence on traditional means of rapid conveyance of surface runoff rather than source control methods, such as flood detention or smaller-scale green stormwater infrastructure, coupled with poor land-use controls and inadequate municipal solid waste management, places like Los Platanitos face a constant risk of flooding. The community was originally founded in the 1980s at the confluence of three ephemeral creeks within a steep canyon that had been used as landfill, and homes were constructed within the active channel and floodplain of the creek. This precarious geography is exacerbated by extensive development of asphalt and concrete surfaces upstream from the community and a dense pattern of self-built homes, further reducing permeability and significantly increasing the velocity of surface runoff. Also, as in the case of informal settlements elsewhere in the Santo Domingo metropolitan area, the community lacks municipal sewage, water, electricity, and solid waste services.

As a result, sewage and household waste accumulate in public spaces and in waterways, clogging the informally constructed drains and culverts and reducing the drainage capacity of the creeks. Because of the routine flooding of homes located in the floodplain even during short rains, the community suffers from alarmingly high rates of respiratory and intestinal diseases (Sletto (editor), 2008, 2010). This combination of informal construction in topography unsuitable to development, a high proportion of impermeable surfaces, and public health challenges stemming from environmental contamination has left residents exceedingly vulnerable in the face of heavy rainfall and hurricanes—a situation common to hundreds of other informal settlements in the Santo Domingo metropolitan area (Chantada, 1996; Navarro and Mercedes, 1996). Because of these precarious conditions, Los Platanitos and other communities like it are known as *cañadas*, a moniker that refers not only to the streams and the rugged topography in which the communities are located, but which also encapsulates the precariousness of life in these informal settlements and the exclusion of residents from local governance and service provision processes.

However, despite these glaring inequities and vulnerabilities, Los Platanitos is also characterized by strong social networks and an unusual sense of place and community. These community support mechanisms made it possible for the original founders of the community to

construct the community infrastructure—homes, alleyways, staircases, drainage channels, and the like—without any government assistance, resulting in an origin story which today is recounted with great pride and which constitutes an important source of community identity (Sletto (editor), 2014, 2016). At the same time, the founders of Los Platanitos—most of whom were rural migrants forced to relocate to the capital city in search of employment—developed an extensive network of miniature gardens and a surprisingly dense cover of fruit trees and palms, constituting an informal green infrastructure network (Sletto (editor), 2014). Research conducted via the service-learning projects has found that residents in Los Platanitos cultivate nearly 100 different plant species for medicinal and ornamental purposes and also to supplement their household diet (Sletto (editor), 2014). Despite the prevalence of impermeable surfaces in the neighborhood, plants are cultivated in pots and in numerous miniature gardens and patios, giving Los Platanitos, in some places, the feel of a rural community. Eighty percent of these plants are shrubs and trees, providing essential ecological services in terms of shade, rainfall abstraction, and enhanced soil structure (Sletto (editor), 2014).

Also, following the most precarious, early years, neighborhood organizations emerged and began applying pressure on government to provide basic infrastructure improvements and public services (Sletto (editor), 2010, 2012; Navarro and Mercedes, 1996; Pelling, 2002). In more recent years, the engaged scholarship conducted by The University of Texas has built on this tradition of organizing, working with residents to establish Fundación Los Platanitos, a community organization dedicated to solid waste management, and Mujeres Unidas, a women-led group that, since 2012, has been operating a community-based composting project (Sletto (editor), 2010, 2012, 2014) and has been working to develop a community greenhouse initiative. This tradition of self-help and organizing, local use of green infrastructure technologies such as gardening and composting, and relationships developed via the engaged scholarship efforts beginning in 2008 provided a foundation for developing a new, hybrid community of practice—spanning community level actors, civil society organizations, stormwater professionals, and other local government representatives—around SUWM and integrated community development in order to address the persistent, severe environmental and socio-economic challenges facing Los Platanitos.

3.2. Developing the Mesa de Concertación

In 2014, residents, civil society partners, and local government officials initiated a coordinating process to more intentionally foster an approach to SUWM that incorporates community development imperatives in Los Platanitos. This effort took the form of a Mesa designed to bring local government authorities, local civil society representatives, and neighborhood activists to the same “table” as a mechanism for strategizing and pursuing integrated community development in a coordinated way (Table 1). It also gave rise to the idea of establishing a “consorcio” or consortium, which can act as a legal non-profit entity with the express purpose of putting into action the

coordinated project ideas coming out of the work of the Mesa. Still in the planning stages, the eventual consorcio will be a legal community administrative unit formally empowered to manage resources, enter into legal contracts, and carry out projects. Through their participation in the Mesa, the municipality and other institutions will support and advise the community-led consorcio in its work.

The Mesa was inspired, in particular, by the community’s ongoing work with the composting project, which put residents—and the local NGO representatives working with them—into semi-regular, if somewhat ad hoc, contact with local government partners who were aware of the community’s ongoing collaboration with The University of Texas. This created a dynamic in which community members, local NGO representatives, and different members of the local municipal apparatus were regularly in touch and building rapport with one another. The pilot composting project also contributed to greater interest in integrated community development among residents, in effect creating an appetite for increased coordination of local social and economic development efforts within Los Platanitos.

The Mesa was originally envisioned with both long-term and short-term goals in mind. In the short term, it has focused on trying to coordinate the assistance of government agencies and civil society organizations to aid the community in expanding the composting project. The members of the Mesa observed that this nascent project could serve as a foundation for at least a partial SUWM solution to mitigate organic waste contamination of the waterways. The longer-term goal of the Mesa has been to facilitate dialogue about the sustained expansion and management of broader community-wide SUWM efforts, including facilitating the work of Fundación Los Platanitos and Mujeres Unidas as they have sought to expand their local recycling project, build a community greenhouse to leverage the community’s household plant tradition and composting project, and develop a comprehensive community-based solid waste management program. The Mesa has thus been seen as a means to shape the development of formal stormwater management systems to incorporate SUWM principles of green stormwater infrastructure source controls and community solid waste management as well as social and economic considerations. That is to say, participants of the Mesa saw the interconnected solid waste and flooding problems as a focal point for broader organizing, situating SUWM as a central element of an integrated development agenda that sought to bring about economic, social, and environmental improvements.

In 2016, the Oficina de la Presidencia de la República Dominicana (Dominican President’s Office) announced its intent to develop a stormwater drainage project in Los Platanitos to be implemented by the CAASD. Emerging from a broader initiative by the President’s Office to improve sanitation and water quality in the watershed of the Isabela and Ozama, the project corresponded in important ways with the objectives conceived by the Mesa. As a result, the Mesa was recognized by the CAASD and the President’s Office as the official coordinating body for the project, elevating the Mesa to the principal space for dialogue between the CAASD, local government, national civil society organizations, formal state-sanctioned neighborhood associations, and community-based organizations such as Mujeres Unidas.

Table 1
Development Actors in Los Platanitos.

Community	Government	Civil Society	Academic
Junta de Vecinos Los Trinitarios-Area Residents' Association	Dirección General del Ordenamiento y Desarrollo Territorial-National Planning Agency	Centro de Investigación y Apoyo a Mujeres y Familias (CIAMF)-Local NGO	Universidad Nacional Pedro Henríquez Ureña-Local Academic Partner
Fundación Los Platanitos- Neighborhood Foundation	Dirección General de Programas Especiales de la Presidencia-Special Projects Agency of the Presidency	Comité para la Defensa de los Derechos Barriales (COPADEBA)- Local NGO	University of Texas-International Academic Partner
Mujeres Unidas-Women's Cooperative	Corporación de Acueducto y Alcantarillado de Santo Domingo- Metropolitan Water Utility Ayuntamiento Santo Domingo Norte- Local Government	Acción Comunitaria por el Progreso (ACOPRO)-Local NGO Ciudad Alternativa-Local NGO	

The dialogue facilitated by the Mesa has allowed community organizations and their civil society partners to promote an integrated perspective to SUWM that couples green and grey stormwater management with local economic and social development imperatives, providing low-income residents unprecedented influence to shape the contours of a major state-funded drainage project in the Dominican Republic. The Mesa has worked to integrate the economic development efforts of community organizations with the work of engineers from ASDN and the CAASD, including the composting and greenhouse projects. While the Mesa has served as a means for the CAASD to present forthcoming engineering interventions, it has also served as a space for neighborhood association members, community organizations, and their civil society partners to present counterproposals and concerns about the project. Thus the Mesa has come to constitute what [Watson \(2009, 2270\)](#) refers to as an “interface zone” in the co-production process, where “state efforts at urban development” are “met or confronted by their target populations” in ways that “shape the nature of interventions.”

However, the Mesa has also become a fulcrum of contestation between separate community groups, and between community organizations and the CAASD. Because of the immediacy and potential impact of the CAASD project, and due to the elevation of the Mesa into an “interface zone” ([Watson, 2009](#)) where residents could press their claims vis-à-vis the state, relationships within the Mesa became charged. This led to a jostling for position between community groups, Fundación Los Platanitos and Mujeres Unidas in particular, reflecting the struggle for limited resources that often characterize neoliberal, networked governance configurations. The struggle was additionally colored by relations of power defined in part by gender, as male leaders of Fundación Los Platanitos claimed stormwater management was a male expertise, thus attempting to position themselves for short-term employment by being associated with the infrastructure project. Mujeres Unidas, meanwhile, strategically foregrounded women’s entrepreneurial capacities and their “precedent setting” ([Appadurai, 2001](#)) composting project which they frame as a means of local economic development, but also as a flood mitigation strategy that complements the broader SUWM approach by fostering the development of local gardens and other permeable green spaces. At the same time, Mujeres Unidas has been successfully pressuring the CAASD to meet the housing needs of families displaced by the construction process.

Ultimately, by strategically deploying their composting project as a “precedent setting” initiative with potential both for economic development and multifunctional green infrastructure, Mujeres Unidas has secured a funding commitment from the CAASD to expand the composting project and develop the community greenhouse as a so-called *Proyecto colateral* (collateral project). Furthermore, the work of the Mesa has led to an approach to the construction of new homes for displaced residents that is new to Santo Domingo. At the inception of the CAASD project, and before the Mesa had earned status as the official coordinating entity, lack of information from the CAASD regarding displacement of families due to the excavation of the main channel caused widespread anxiety and even street demonstrations. Through the Mesa, however, community organizations ensured the CAASD provided displaced families with temporary rental apartments as they await the provision of new homes now under construction by the CAASD. Moreover, rather than large low-income apartment blocks in remote locations which have characterized previous efforts to accommodate those displaced by infrastructure project, new residences are being built in situ and at a small scale. The CAASD is furthermore considering rebuilding homes that had to be removed for construction as a means of preserving social networks in the community.

Thus as the service and knowledge co-production model is evolving in these early stages of the stormwater infrastructure project, a common assumption is slowly developing among the players in this emerging hybrid community of practice: the SUWM project should account for the social needs of residents while fostering local economic

development initiatives, especially those with potential significance in terms of green infrastructure provision. This is particularly new for the engineers of the CAASD, who initially limited their thinking to traditional, end-of-pipe discharge solutions but who now are now starting to support an integrated vision of SUWM that incorporates green stormwater infrastructure source control measures with social and economic considerations.

4. Discussion

The Mesa has emerged as a promising model among Dominican urban management practitioners concerned with stormwater and solid waste management, while at the same time, the negotiations taking place within this “interface zone” ([Watson, 2009](#)) reveal the contestations that can characterize the co-production of infrastructure services. Because of the diversity of voices and priorities represented at the table, the Mesa encourages wide discussion of possible projects that could address multiple community needs and reflect multiple perspectives and disciplinary orientations. As one civil society member of the Mesa indicates, “the dynamic [between the community and state agencies] is different because before we simply made demands, and now, we still make demands but we propose solutions at the same time, we help the process [of meeting our demands] get off the ground.”

In this way, the Mesa provides a multi-directional flow of information that encourages “social learning” ([Farrelly and Brown, 2011, 723](#)) by all participants, ultimately serving as a capacity building tool by facilitating the intersection of different communities of practice and by helping to blur boundaries in terms of norms and practices across actor groups ([Gonzalez et al., 2011](#)). This blurring of boundaries allows participants who principally identify as part of one community of practice to access information and perspectives previously isolated in other communities of practice. In so doing, multiple interacting communities of practice can work together to fill in each other’s “blind spots” ([Van de Meene and Brown, 2009, 1450](#)), even potentially forming a new composite or hybrid community of practice capable of spanning boundaries between actor groups. Since communities of practice are defined in part by their shared norms of knowledge acquisition and reproduction ([Lave and Wenger, 1991; Kerno, 2008](#)) in addition to their highly-situated forms of “knowing in action” ([Amin and Roberts, 2008](#)), the lessons from Santo Domingo illustrate the potentials of such Mesas for creating a space for new, joint ways of knowing and practice.

Although the Mesa is a highly local project and thus can be understood as a form of “niche level experimentation” ([Farrelly and Brown, 2011, 723; Geels, 2004](#)), municipal and NGO partners as well as CAASD engineers are now explicitly advocating its replicability. Some NGO participants refer to the Mesa as a “new methodology” for development coordination, suggesting that this niche level experimentation is emerging as a starting point for larger regime-level “normative” and “structural” changes ([Farrelly and Brown, 2011, 722](#)) in how municipalities coordinate local level integrated community development efforts in the Santo Domingo metropolitan region.

At the same time, however, the Mesa can also be understood as a governance tool that involves and thus “responsibilizes” ([Shamir, 2008; Sletto and Nygren, 2016](#)) low-income residents in the provision of the same basic services that may be provided by the state in more formally developed areas of the city. While the type of citizen participation required by the Mesa can be understood as democratization of infrastructure development, it can also be viewed as a means of shifting responsibility for basic service provision from the state to local communities ([Mitlin and Bartlett, 2018](#)). Due to the scale of flood mitigation/conveyance infrastructure required, it is difficult if not impossible for low-income communities to fully self-provide adequately. Furthermore, in its current practice, it appears that communities currently lacking adequate provision of stormwater infrastructure are expected to demonstrate a capacity for self-organizing and management before they

are considered “legitimate” recipients of state efforts to enhance local service provision. This dynamic fuels competition among community actors for positioning and access to limited state resources. The Mesa, then, could be seen as a space for community members to “perform” their willingness and capacity to participate and assume responsibility as a pre-requisite for “earning” access to city resources and services. In this way, co-production of infrastructure services through such structures as the Mesa becomes a way for poor communities to “augment their capacity to negotiate successfully with the state” (Mitlin, 2008, 340), but not to fundamentally renegotiate the structural relationships with municipal authorities.

5. Conclusion: prospects for SUWM in Los Platanitos and beyond

Ultimately, in terms of fostering SUWM practices in Los Platanitos that are replicable elsewhere in Santo Domingo, the Mesa brings together fragmented municipal agencies, service providers and community development activists, while also serving as a channel for integrating community-based knowledge and expertise into norms of integrated infrastructure development practice. Many residents of Los Platanitos already use small rainwater harvesting systems for non-potable household use and gardening, they take great care to tend to their gardens and patios, and they are highly motivated to mitigate drainage problems through self-help strategies such as onsite source controls. And community members have already demonstrated an adaptability to and understanding of the multifaceted benefits of environmentally-sustainable alternatives to traditional service provision, as evidenced by the success of the community-based composting and greenhouse initiatives.

However, whereas existing community practices potentially provide a strong framework for the establishment of a decentralized network of green stormwater infrastructure, some level of state involvement is still necessary to achieve the scale of drainage services required during larger rainfall events that are common throughout the region. While self-provided green stormwater infrastructure can mitigate flooding for small storms and provides multiple ancillary benefits, the necessary upgrades to conveyance infrastructure require the resources and expertise of local government actors. Decentralized small scale controls alone cannot handle large flood events, especially in areas with extreme rainfall intensities and informal development, making a hybrid green-grey approach necessary in most instances.

In this context, the Mesa can serve to encourage a transition to SUWM as it fosters citizen participation and knowledge-sharing between local actors and stormwater professionals (Green et al., 2012), thereby encouraging forms of shared responsibility and networked governance that have been identified as necessary for the successful practice of SUWM. We suggest that the Mesa is performing functions akin to those of bridging organizations by “bringing together key actors, across scales and levels, for the creation and sharing of knowledge, social learning, access to resources (financial and knowledge), building trust, generating sense making and potentially reducing transaction costs of collaboration” (Brown et al., 2013, 703). We also suggest that, in the long term, this work may disrupt established institutional strategies and aid in steering a transition in stormwater management regimes across metropolitan Santo Domingo (Brown et al., 2013). Due to institutional fragmentation and a widespread distrust of green stormwater infrastructure among stormwater professionals, there have long been significant barriers to a top-down implementation of an integrated SUWM strategy. The co-production facilitated by the Mesa offers a way forward to begin the type of bottom-up, non-linear, co-evolutional changes that have been shown to successfully effect an institutional transition to SUWM in Melbourne, Australia (Brown et al., 2013).

However, as noted previously, the Mesa as a service co-production platform does not necessarily represent a mechanism for fully undoing power imbalances between the various actor groups and communities of practice, both expert and non-expert, that are engaged in co-

production efforts. Rather, our research around the experience of the Mesa in Los Platanitos contributes to an understanding of how such platforms can emerge as productive, if also sometimes contentious and still asymmetric, “interface zones” (Watson, 2009) in which the various competing priorities, values, and disciplinary orientations across actor groups can be more openly negotiated and contested, potentially to the benefit of less powerful actor groups, but also potentially not to their benefit. Through a grounded interrogation of one such example, this study contributes to an understanding of both the limitations and possibilities for the co-production of SUWM services in contexts of high informality and asymmetric community-state relations, particularly those characteristic of neoliberal urban governance arrangements across the humid tropics. It similarly informs the role that such platforms for co-producing SUWM services can play in influencing how stormwater management professionals view principles of SUWM and integrated development more broadly.

The green infrastructure projects and associated community capacity building and organizing efforts emerging from the Mesa illustrate both niche-level socio-technical experimentation as well as political organizing capacity, and represent a potential first step towards a larger institutional shift towards SUWM in Santo Domingo. Future demonstration projects would allow local stormwater professionals to “learn-by-doing” (Brown et al., 2013, 706) in a relatively low-stakes and low-visibility environment, building both technical capacity and confidence in these alternative technologies. In addition to establishing a common understanding of and “safe” testing ground for SUWM practices, the Mesa can also help build new institutional relationships by bringing together key state and non-state actors that do not typically interact in the provision of traditional stormwater services, thus potentially fostering the sort of stormwater controls and other integrated community development outcomes long sought by residents of Los Platanitos and other informal settlements in Santo Domingo and elsewhere.

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